

CLAIMS

1. A gas sensor comprising:

a gas detection element;

a ceramic wiring substrate on which the gas detection element is mounted; and

a protective cap which is attached to the ceramic wiring substrate in such a manner as to cover the gas detection element and which is made of metal, defines, when attached to the ceramic wiring substrate, a gas-measuring space in cooperation with the ceramic wiring substrate, and has a gas intake for introducing gas to be measured into the gas-measuring space from the outside thereof.

2. A gas sensor according to claim 1, wherein the protective cap is held on the ceramic wiring substrate in a nonadhering condition.

3. A gas sensor according to claim 2, wherein the ceramic wiring substrate has a multilayer structure in which a plurality of ceramic dielectric layers are laminated; a recess is formed on a portion of a side surface of the ceramic wiring substrate which corresponds to a side surface of a ceramic dielectric layer other than an uppermost ceramic dielectric layer which forms a top surface of the ceramic wiring substrate; the protective cap has a perpendicularly projecting portion extending along the side surface of the ceramic wiring substrate; and an engagement projection to be fitted into the recess is formed on the perpendicularly projecting portion.

4. A gas sensor according to claim 3, wherein the ceramic wiring substrate has a substantially quadrangular shape as viewed along the direction of lamination of the multilayer structure, and the recess is formed on each of at least two opposed side surfaces of the ceramic wiring substrate.

5. A gas sensor according to claim 3 or 4, a guide recess is formed on the side surfaces of the ceramic wiring substrate so as to guide the perpendicularly projecting portions to locations where the engagement projections are fitted into the corresponding recesses.

6. A gas sensor according to any one of claims 1 to 5, wherein the gas detection element includes a diaphragm structure section, and the diaphragm structure section includes a gas detection portion;

the protective cap has a plurality of the gas intakes formed in a ceiling portion in opposition to a mounting surface of the ceramic wiring substrate on which the gas detection element is mounted; and

the plurality of gas intakes are formed such that when the gas intakes are viewed from the outside of the ceiling portion along a direction perpendicular to the mounting surface, the diaphragm structure section of the gas detection element is invisible therethrough.

7. A gas sensor according to claim 6, wherein element-side electrodes are provided on the gas detection element;

substrate-side electrodes are provided on the ceramic wiring substrate;

connection portions are provided for connecting the element-side electrodes and the corresponding substrate-side electrodes; and

the plurality of gas intakes are formed such that when the gas intakes are viewed from the outside of the ceiling portion along a direction perpendicular to the mounting surface, the connection portions are invisible therethrough.

8. A gas sensor according to any one of claims 1 to 7, wherein the gas detection element includes the diaphragm structure section, and the diaphragm structure section includes the gas detection portion;

the ceramic wiring substrate has a multilayer structure in which a plurality of ceramic dielectric layers are formed such that inner wiring layers are sandwiched therebetween; and

a recess is formed on the ceramic dielectric layer among the plurality of ceramic dielectric layers on which the gas detection element is mounted, in a region in opposition to the diaphragm structure section.

9. A gas sensor according to any one of claims 1 to 8, wherein a bottom surface of the ceramic wiring substrate which is located opposite a side where the gas detection element is mounted is formed substantially planar, and outer electrodes to be electrically connected to a circuit board to which the gas sensor is fixedly attached are formed on the bottom surface.

10. A gas sensor according to any one of claims 1 to 9,

wherein a plurality of the gas detection elements which respond to different gas species are mounted on the ceramic wiring substrate.